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AUTHOR Petty, Norman H.; Todd, Anne
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ABSTRACT

A project sought to identify variables that are associated with student success in allied health care programs in order to provide program directors with better admissions information. Forty-nine allied health programs provided data on over 1,800 students. One questionnaire generated these basic program data for each participating program: dropout rates, class sizes, types of admissions tests used, and general admissions criteria. Program directors also provided information on student factors they thought might be related to student success. Participating programs were associate degree nursing, dental hygiene, medical laboratory technology, physical therapy, radiologic technology, and respiratory therapy. Program directors subsequently completed student data profiles. Data analysis revealed that age, specific admissions tests, and student personal characteristics had predictive power in relation to the measure of student success--grade point average (GPA). Preliminary program-specific admissions models showing the relationship between the dependent variable GPA and various independent or predictive variables were developed for four programs: nursing, radiology, respiratory therapy, and physical therapy. Future research should be undertaken to determine the dimensionality of the 11 perceived factors (student personal characteristics), set up experimental comparisons between admissions tests within specific program areas, and develop specific admissions models. (Instruments and correspondence are appended.) (YLB)

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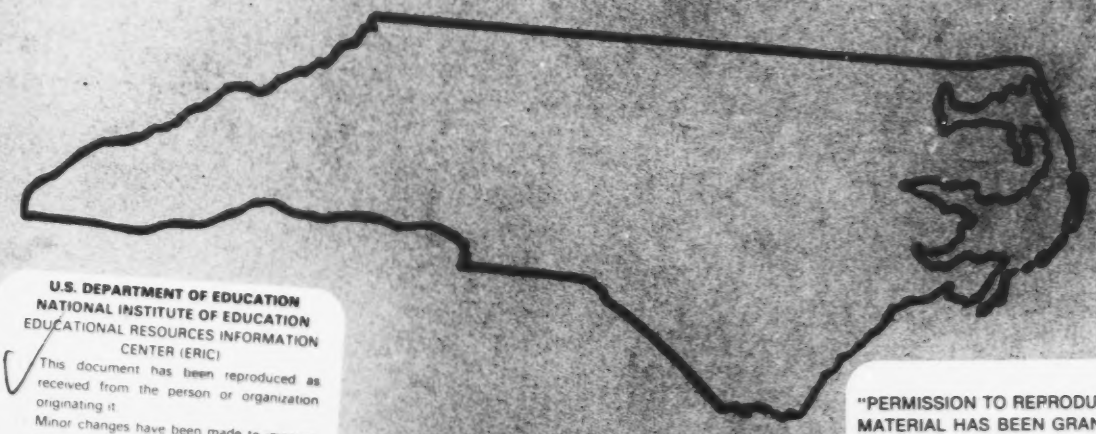

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A MODEL TO IMPROVE THE SUCCESS RATE OF STUDENTS IN SELECTED HEALTH CAREER PROGRAMS IN THE NORTH CAROLINA COMMUNITY COLLEGE SYSTEM

FINAL REPORT

Norman H. Petty, Project Director
Central Piedmont Community College
Charlotte, North Carolina

Anne Todd
Independent Consultant
Data Development

June, 1985

A Project Funded
by the
North Carolina Department of Community Colleges

NORTH CAROLINA DEPARTMENT OF COMMUNITY COLLEGES

DIVISION OF PLANNING SERVICES

RESEARCH PRIORITY AREA: Institutional Student Testing Services

PROJECT TITLE: A Model to Improve the Success Rate of Students in Selected Health Career Programs in the North Carolina Community College System

PURPOSE: To determine, through research, the variables which are related to student success in allied health programs in North Carolina.

PROJECT DATES: January 1, 1984 to June 30, 1985 (Delayed at the request of the Division of Planning Services, Department of Community Colleges)

BUDGET: $27,744

AGENCY: Central Piedmont Community College
P. O. Box 35009
Charlotte, NC 28235

PROJECT DIRECTOR: Norman H. Petty
Central Piedmont Community College
P. O. Box 35009
Charlotte, NC 28235
(704) 373-6424

A MODEL TO IMPROVE THE SUCCESS RATE OF STUDENTS
IN SELECTED HEALTH CAREER PROGRAMS
IN THE NORTH CAROLINA COMMUNITY COLLEGE SYSTEM

ABSTRACT

The North Carolina Community College System faces a dilemma in its allied health programs. The problem relates to the need to maintain an open door environment but provide quality graduates of health care programs.

This project sought to identify variables which are associated with student success in health care programs in order to provide program directors with better admissions information. Forty-nine allied health programs provided data on students for a total of over 1800 individuals. Analysis of the data revealed that age, specific admissions tests, and student personal characteristics had predictive power in relation to the measure of student success--GPA.

The project presentation closed with suggestions for future research.

ACKNOWLEDGEMENTS

A special thanks is extended to the forty-nine program directors from twenty-six schools who took the time to gather all of the data included in the study.

Thanks to the advisory committee for setting the project on the right track.

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Thanks to Sandi Sides for typing the project report.

And, thanks to Anne Todd for managing the data from computer card input into on-line statistical analysis.

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Appendix 1: Health Careers Success Project Program Questionnaire

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A MODEL TO IMPROVE THE SUCCESS RATE OF STUDENTS IN SELECTED HEALTH CAREER PROGRAMS IN THE NORTH CAROLINA COMMUNITY COLLEGE SYSTEM

Introduction

This project represents a desire by those in the education of health professionals to make the best admissions decisions possible. "Good" decisions require a thorough knowledge of the characteristics of a successful student. That is what this project is about--identifying student characteristics that seem to be related to later success in health care programs.

Description of the Problem

Community college health career educators are continually wrestling with the problem of how to run quality health care training programs within an environment of an open door admissions policy.

The dilemma is that the open door policy of institutions guarantees essentially a non-selective admissions policy, i.e., those who apply are admitted, subject only to budget and space constraints. This open door policy comes into conflict with the need for health care programs to train highly qualified people. Simply stated, some applicants are better qualified and more likely to succeed in health professions than others. So the problem is how to reconcile an open door admissions policy with the need for selective admission of health care students.

The admission of unqualified students to health care programs leads to at least three difficulties. First of all, students who do not "fit" a program will eventually drop out as they get further and further into difficult, demanding courses. The

discouragement from the "drop out" experience may lead them to become discouraged with all community college programs--including those that they may well be qualified to complete. Secondly, most health care programs are set up on the basis of one-time entrance dates, usually in order to economically schedule the small enrollment classes prevalent in most programs. For these programs, drop outs are a large destablizing factor, because of the awkwardness associated with bringing in new students after the year's program is in session. Thus, many programs end up with extremely small graduating classes as compared to the number of entering students. Thirdly, open door programs, which fill up quickly, may cause the program to turn away many later, extremely well qualified applicants, thus reducing the overall quality of the students in the program and subsequently in the profession.

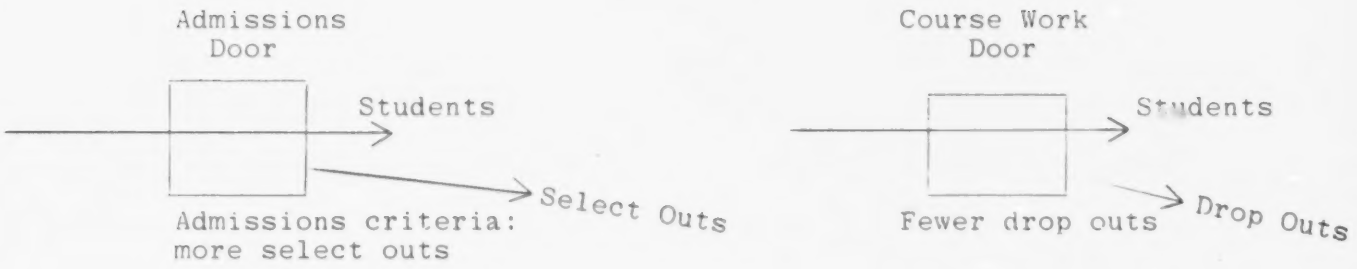
One answer to the problems associated with an open door admissions policy--is to become more selective. It is well known that the college program that becomes more selective will usually experience a decrease in drop out rates, etc.[1] As a matter of fact, many academically demanding community college programs such as the allied health professions are rapidly moving toward greater selectivity in admissions in order to reduce drop out rates and improve program stability.

In a sense, selectivity of admissions is merely a process of shifting the inevitable "weeding out" process, which will always occur in a rigorous program, from the actual course work back to the admissions process.

Figure 1

Open Door

Selective Admissions



This prescreening process greatly reduces the costs to the institution and greatly enhances course stability (because of a steady enrollment). But admissions selectivity has its own set of problems. The primary problem is that a selective entrance policy--without a corresponding increase in admissions counseling, advisement and testing--will lead to a significant modification of the open door policy.

So the challenge for the community college and technical institute is to maintain a general open door policy, while instigating appropriate program selectivity. That is a challenge that every institution must meet in the eighties.

One strategy is to maintain an open door admissions policy

but strengthen the counseling/testing of the institution so that students can be directed to those programs where they are motivated and capable of success. Students, so led, will be more successful, drop out rates will be reduced, programs will be able to maintain stability, and institutional resources will be better utilized.

Such a policy of directive admissions must be backed by fair, replicable data that clearly indicates those variables that predict student success. In other words, the process of selecting students in and out of a program must be done in such a manner that there is a high probability that the most qualified students will be selected.

Project Questions

Administrators who call for improved guidance and placement will encounter numerous issues involved in the implementation of directive admissions. This project is concerned with one particular issue, that of defining more clearly the entrance variables associated with student success in allied health programs. Specifically, the research question to be addressed is: what standardized entrance criteria will improve the probable success rate of applicants in selected health care programs in North Carolina? A related, but larger question is: What admissions model(s) will be of assistance to community college counselors and staff in aiding students to select or not select health occupations?

Project Methodology

The research project was organized into several distinct phases in order to develop data that would be useful in answering

the research question.

Step One:

Literature relevant to the topic was reviewed in order to determine what variables might be potentially related to student success.

Step Two:

Health care program directors and institutional presidents were contacted to determine interest in participating in data gathering efforts.

Step Three:

The research strategy was modified in order to comply with time constraints. Originally, the project was to begin in September of 1983. However, due to funding delays, the project director was asked and agreed to not begin the project until January of 1984. The delay led to a modification of the research strategy. The initial concept was to administer a number of competing admissions tests to an experimental group of health career students and track their success record over a period of two years. The delay made this strategy impossible. Therefore, the decision was made to do a field study by gathering existing data from established student groups.

Institutions and programs that agreed to participate in the study were sent the first questionnaire called a Program Data Collection Sheet (PDCS). This questionnaire (Appendix 1) provided information about each participating program's size, selectivity, drop out rate, and testing programs.

Step Four

Responses from the PDCS were used to develop a Student Data Profile (SDP). Each participating program was sent enough SDP's so that one profile could be filled out for each student in the designated classes. Health careers program directors and counselors were the designated individuals who completed these forms (Appendix 2).

Step Five

Responses from the PDCSs and students' SDPs were keypunched and entered into an on-line data file located in the data processing facility of Central Piedmont Community College.

The statistical program SAS was used to develop appropriate descriptions of the data and to analyze it to determine significant relationships.

Step Six

Conclusions from the analysis were developed and compiled. Also, implications for future research were discussed.

Literature Review

A number of studies have been done which relate various entering student characteristics and performance levels to later student success. This section discusses a few representative studies from this body of literature.

Schwirian surveyed 150 schools with nursing programs to determine the most common entrance criteria used by the schools. She found that health data, high school rank, high school GPA, applicant interview, and prior college GPA performance were the most widely used admissions criteria.[2]

Bello in a study (N=380) which defined success as completion of the nursing program and passage of the state licensing exam,

found that age, Comparative Guidance and Placement Tests Reading and Sentence scores (CGP), high school algebra and college level science grades were the best predictors of success in an Associate Degree Science Program.[3]

Larkin concurs with the previous study in indicating that certain CGP test scores were significantly related to success or failure on state board exams.[4]

A somewhat broader study related to four allied health programs was conducted at the Miami-Dade Community College Medical Center Campus. Independent variables included in the study were high school GPA, the number of high school natural science courses taken, the high school English grades, high school natural science grades, high school math grades, percent rank in high school and the college GPA at the time of the study.

Criterion of success or dependent variables were final college GPA and whether the student graduated or withdrew from the program. Three significant correlations were found between the independent and dependent variables. (1) Initial GPA was a significant predictor of final program GPA in dental hygiene. (2) High School grades in natural science were significantly related to graduation in medical laboratory technology. (3) High school English grades were positively related to predicting the probability of graduation in medical laboratory technology.[5]

A somewhat contrary view of the value of academic qualifications were reported in a study by Tatham.[6] Using (1) completion of the program, (2) GPA in the clinical courses and (3) scores on the nursing and dental hygiene board exam for

measure of success, the research indicated that academic variables were not found to be significantly related to completion of the program, but were somewhat useful in identifying students who might have difficulty in passing clinical courses or state board exams. The finding that academic variables are not related to program success is not typical. (In fact, the author indicates that the data was not complete for this research.) Most of the research follows the pattern of: Peristers and Withdrawals: An Analysis of the Differences in Finding which indicates that measures of academic achievement/ability are significantly related to success in nursing programs.[7]

Yet another study (Meier) sought to find variables associated with first year academic success in an Associate Degree Nursing Program. It (N=630) found that high school GPA, Nelson-Denny Vocabulary scores, and student identification of the lowest acceptable grades in specific courses were consistently related to GPA performance.[8]

Additional studies reviewed indicated (1) a positive relationship exists (N=86) between high school GPA, ACT ability test scores and persistence in health programs. (Keene)[9]; (2) that CGP Sentences, CGP Reading, CGP Math, academic motivation, and the sex of the student were related to student GPA performance, while CGP Reading and Sentence scores, age, high school algebra and college science grades were related to program success (Rogers).[10]

The literature review indicates that there is not a clear, unambiguous picture of the characteristics of the successful,

allied health student. However, several generalizations are in order.

First of all, a number of generalized categories of predictor admission's characteristics seems to surface. They are: prior academic work, prior academic performance, admissions test data, and personal characteristics data. Prior academic work refers to the kind of academic work done by the student prior to admission to a specific health program. That data includes courses taken in high school as well as previous college work. The literature indicates that for certain specific allied health programs, the student's previous academic work is important--particularly the amount of English, math and science that is taken.

Prior academic performance on the other hand refers to how well the student has done grade point wise in high school and previous college work regardless of specific courses taken. As might be expected, the evidence is fairly strong that high school GPA is significantly related to allied health GPA and prior college GPA is almost universally related to allied health GPA.

The admissions test research is extremely complex to interpret because the studies are dealing with a number of different factors. That is, each research study is concerned with one or more different allied health programs. Furthermore, within each study, a variety of admissions tests are used, each one measuring slightly different dimensions of academic aptitude.

Despite this complexity, a basic observation can be made which is useful for this research project. Measures of academic aptitude are consistently correlated with student GPA and state

board scores, the variances are related to the "fit" of particular tests with the particular needs of particular programs.

As far as this research is concerned, the student's personal characteristics can be divided into two groups: the observable data such as age, financial status, marital status and the perceived data such as student attitudes and motivation. Research into this area contains a few strong relationships but is generally ambiguous. For example, in regard to observable characteristics, age seems to be generally positively correlated with student success in certain allied health programs. Other research finds a somewhat higher GPA average in female students. Research in the area of perceived student characteristics is less clear. Some studies find significant relationships between motivation and maturity variables or their surrogates and GPA while other studies don't find any predictive power. Probably the difficulty in measuring these highly subjective variables is part of the reason for the instability in findings.

In summary, the literature suggests that their is predictive power in various variables but the exact fit between variables and programs still needs work.

Obtaining Participation

Program directors of allied health occupations in the North Carolina Community College system were contacted and requested to participate in a field study of success variables. Those institutions that responded positively were followed up with a letter to the president, requesting permission to allow their program(s) to participate. This process, which took several months,

resulted in a total of 49 programs from 26 institutions that agreed to be a part of the study.

Program Data Collection

For the reasons mentioned earlier, a field test strategy was chosen to replace the original experimental design. Part one of the data gathering effort was directed at general program data. Appendix 1 displays the Program Questionnaire.

This questionnaire generated basic program data for each of the participating programs. Data such as drop out rates, class sizes, the types of admission tests used and the general admissions criteria. This questionnaire also contained an open ended question asking the program director to state what student factors they thought might be related to student success. This information was used to generate questions on the Student Data Sheet.

The Program Data Collection Sheet yielded the following profile of participating programs.

Table 1

Program Frequency in Study

Program	Frequency	Percent Total
Associate Degree Nursing	23	46
Dental Hygiene	4	8
Medical Laboratory Technology	5	10
Physical Therapy	1	2
Radiologic Technology	10	20
Respiratory Therapy	6	12

Table 1 indicates the number of health programs included in

the study. Obviously, nursing with 23 programs is the dominant area.

Table 2

Average Enrollment/Percent Drop Out in Study

Enrollment	Number*	Mean	S. D.**	Minimum	Maximum
Average Enrollment 1982	49	32.1	22.4	9	125
Average Enrollment 1983	49	30.7	19.1	10	99
General Drop Out Rate	49	37.0	14.6	0.5%	75%
State Board Pass Rate	44	90.0	11.8	35%	100%

*Number = Number of programs reporting
**S. D. = Standard Deviation

Table 2 presents an overall picture of all the programs in the study. For example, the average enrollment for 1982 for participating programs was 32 students with 49 actual programs included in the study. Table 3, which follows is really an extension of Table 2 in that it presents the same data, but breaks it down by program area. Thus, Table 3 shows that 5 medical lab technology programs were included in the study; their average enrollment in 1983 was 14, the smallest program in that year had an enrollment of 10 and the largest, 17 students.

Table 3

Average Enrollment/Percent Drop Out by Program

	Number of Programs	Mean Enrollment	S. D.	Minimum	Maximum
Nursing					
Enrollment 1982	23	47.2	24.2	20	125
Enrollment 1983	23	44	20	19	99
Drop Out Rate	23	37	9	25	60
State Board Pass	21	90	6.9	71	100
Dental Hygiene					
Enrollment 1982	4	26	12	12	42
Enrollment 1983	4	26.5	9	19	40
Drop Out Rate	4	40	28	8	75
State Board Pass	4	96	4.5	90	100
Medical Laboratory Technology					
Enrollment 1982	5	14	3	10	17
Enrollment 1983	5	14	2	11	16
Drop Out Rate	5	39	15	17	50
State Board Pass	5	93	7	83	100
Physical Therapist Assistant					
Enrollment 1982	1	24	--	24	24
Enrollment 1983	1	24	--	24	24
Drop Out Rate	1	27	--	27	27
State Board Pass	1	100	--	100	100
Radiologic					
Enrollment 1982	10	16	4	10	25
Enrollment 1983	10	17	4	12	26
Drop Out Rate	10	32	19	0	60
State Board Pass	10	90	11	68	100
Respiratory Therapy					
Enrollment 1982	5	4	17	28	
Enrollment 1983	6	4	16	29	
Drop Out Rate	6	15	22	60	
State Board Pass	2	31	35	80	

Table 4 shows the number of programs which required specific entrance criteria. Notice that 51 (more programs participated in initial analysis [51] than in final analysis [49]) out of 51 programs reporting required a minimum score on an entrance placement test while 12 out of 51 required high school class rank as a criteria.

The same information given in Table 4 in a generalized form is presented in Table 5 by program.

Each program was asked to rate its own degree of selectivity. Note that the majority of the health care programs perceived that they were selective in admissions as opposed to open door (see Table 6).

Table 6

Perceived Selectivity of Entrance

Category	Frequency	Percent*
Open Door	1	2
Partial Open Door	8	16
Average	10	20
Selective	30	61

* Not 100% due to incomplete returns

Table 7 indicates the name and frequency of the use of different admissions tests by the sample program. The CGP group of admissions test are the most popular. Of special interest is the large number of locally produced math tests administered by the various schools.

Table 4

FREQUENCY OF REQUIREMENTS FOR ENTRANCE IN VARIOUS HEALTH PROGRAMS
IN THE NC COMMUNITY COLLEGE SYSTEM

BAR CHART OF SCHOOLS

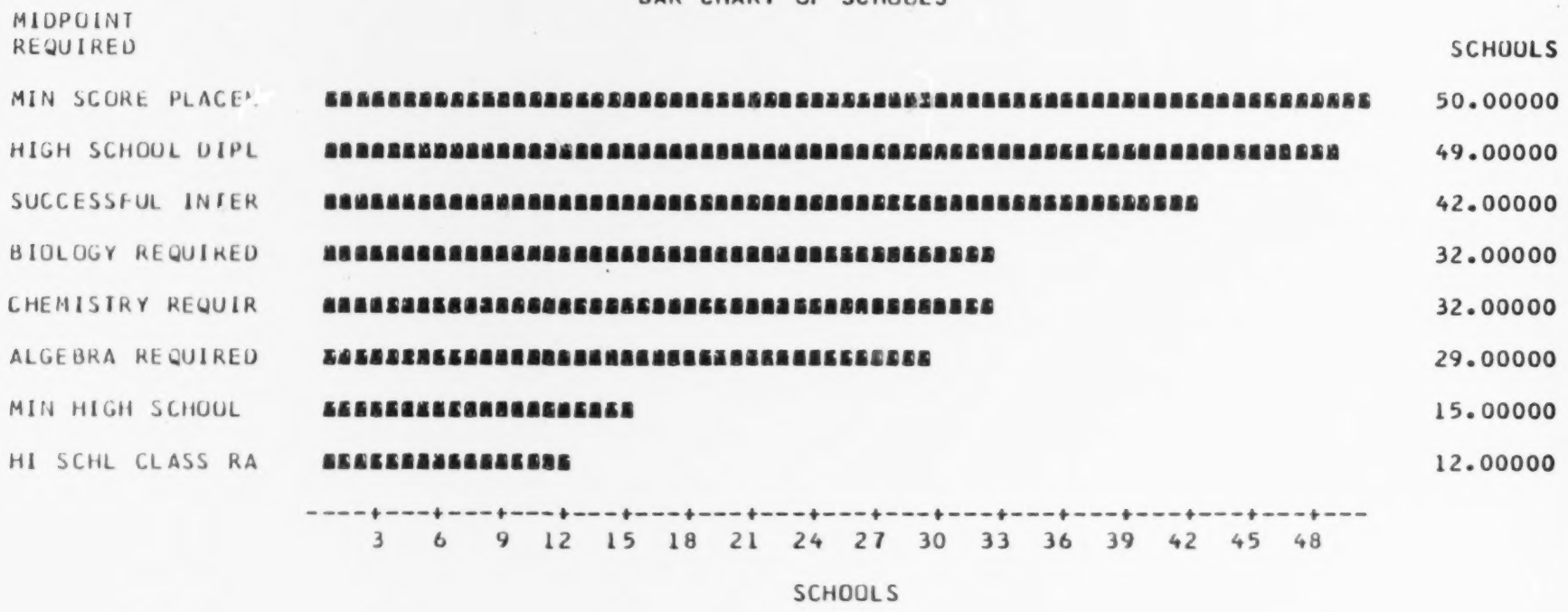


Table 5

Frequency of Requirements for Entering Health Programs

Program	Require	Bar Chart of Number	Number
Associate Degree Nursing	Min score placem		23.0
	High school dipl		23.0
	Successful inter		19.0
	Biology required		15.0
	Chemistry required		15.0
	Algebra required		10.0
	Min High School		6.0
	High school class		4.0
Dental Hygiene	Biology required		4.0
	Chemistry required		4.0
	Successful inter		4.0
	Min score placem		4.0
	High school dipl		4.0
	Algebra required		3.0
	High school class		3.0
	Min high school		3.0
Medical Lab Technology	Min score placem		5.0
	Biology required		4.0
	Chemistry required		4.0
	High school dipl		4.0
	Algebra required		3.0
	Successful inter		3.0
	Min high school		1.0
	High school class		0.0
Physical Therapy	Successful inter		1.0
	Min score placem		1.0
	High school dipl		1.0
	Biology required		0.0
	Chemistry required		0.0
	Algebra required		0.0
	High School class		0.0
	Min high school		0.0
Radiologic Technology	Min score placem		11.0
	High school dipl		11.0
	Successful inter		10.0
	Algebra required		8.0
	Biology required		4.0
	Chemistry required		4.0
	Min high school		3.0
	High School class		2.0
Respiratory Therapy	Min score placem		6.0
	High school dipl		6.0
	Biology required		5.0
	Chemistry required		5.0
	Algebra required		5.0
	Successful inter		5.0
	High school class		3.0
	Min high school		2.0

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Table 7

Summary of Placement Tests Required for Entrance
Selected Health Career Programs, NC Community College System

Test Name	Number
California Achievement Language	1
California Achievement Math	1
California Achievement Reading	1
CGP Algebra	8
CGP Computation	9
CGP English	15
CGP Letter Group	3
CGP Math	18
CGP Reading	18
CGP Reading and Sentences	3
CGP Sentences	3
CGP Total	3
CGP Year Zero	4
Comp Test Basic Skills	2
Dat Language Usage	1
Dat Verbal	2
Gates McGinty Reading	1
Local English	4
Local Math	12
Min Home Reading	2
Nelson Denny Total	2
Nelson Denny Vocabulary	3
Otis Lenon IQ	6
Prentice Hall English	4
PSB Health Occupations	2
PSB Nursing Aptitude	1
SCAT Quantative	1
SCAT Total	1
SCAT Verbal	2
Ward Speece Math	2
PSB	1
	136

Table 8 contains some of the most interesting data from the Program Data Sheet. Each program director was asked in an open ended way (see questionnaire) to indicate the factors they thought were important determinants of student success. (None of

the program directors were aware of what the other director(s) put down.) Responses were categorized into broad response categories and summarized. Table 8 represents a frequency distribution of those responses.

Twenty-nine program directors indicated that student motivation was an important factor in student success. Motivation was followed by student maturity, past academic success, and student support system. (The student support system refers to the family, financial, and school support available to the student.) Two other factors may need interpretation. Theory to practice refers to the student's ability to apply theoretical knowledge in practical situations. Clear expectations refers to how clearly the student sees what the program and instructors will demand of them during their school time.

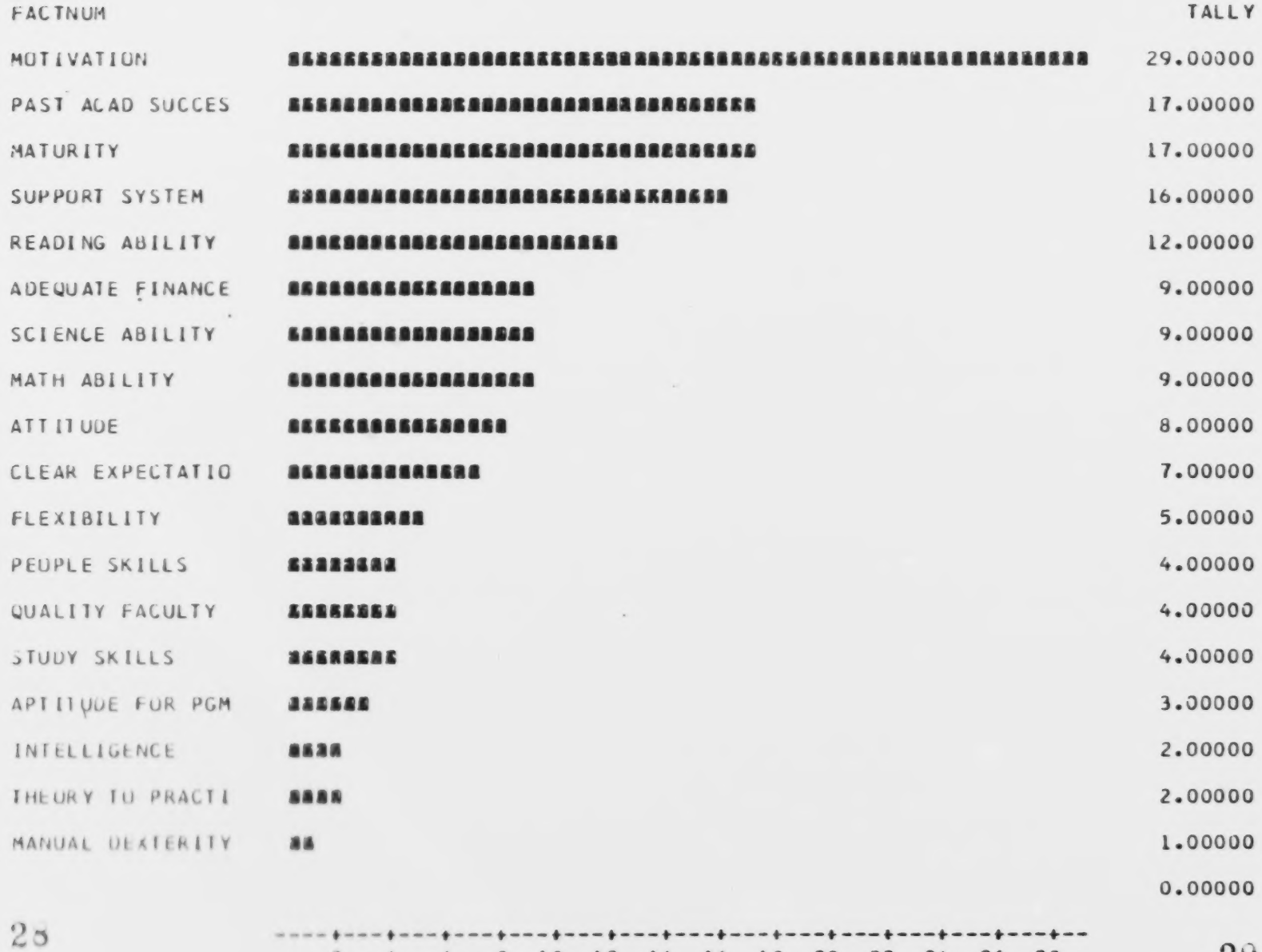
Student Data Profile

A Student Data Profile was developed based on data needs and the responses from the Program Data Sheet. A letter (Appendix 3) was sent to all the programs that returned the Program Data Sheet thanking them for their participation and asking them to fill out the Student Data Sheets. The Student Data Profile is shown in Appendix 2. Care was taken to insure privacy of information by allowing the programs to use their own student numbers without indicating names. Student data included age, race, class, current status, GPA, scores made on admissions tests, state board scores (if available) and a subjective evaluation by the program director as to the student's level on each of 11 factors. These 11 factors came from the open ended questions of the

FACTORS IN STUDENT SUCCESS IN
SELECTED HEALTH PROGRAMS

Table 8

BAR CHART OF TALLY



Program Data Sheet.

It is clear that it was quite an undertaking for the program director to fill out one of these forms for each of their students for two separate classes. Remarkably, the response rate was very good. Forty-nine programs returned a total of 1800 student response sheets.

Table 9 indicates the age distribution of students who were included in the survey. As expected, the 21-25 age group is the largest single age grouping. Interestingly, the high number of 16-20 age group, which is the second largest, seems to indicate that our sample has a relatively large number of students who have recently graduated from high school and moved immediately into a health career track.

Table 10 shows the racial background of the respondents. Although four categories were asked for, only two--Caucasian and Black--were represented enough to show up on the chart.

Table 11 shows the distribution of students included in the survey by program. Nursing, of course, dominates the profile with over 1200 of the 1800 students coming from this area.

Data Analysis

It is always helpful to summarize and describe data in a general fashion. The use of descriptive statistics is an especially important tool in giving the reader a clear picture of the general structure of the data. This section presents several charts and graphs that fill in information not presented earlier. The majority of the section is devoted, however, to the presentation of the statistical analysis undertaken with the SAS program.

S T A T I S T I C A L A N A L Y S I S S Y S T E M

FREQUENCY BAR CHART

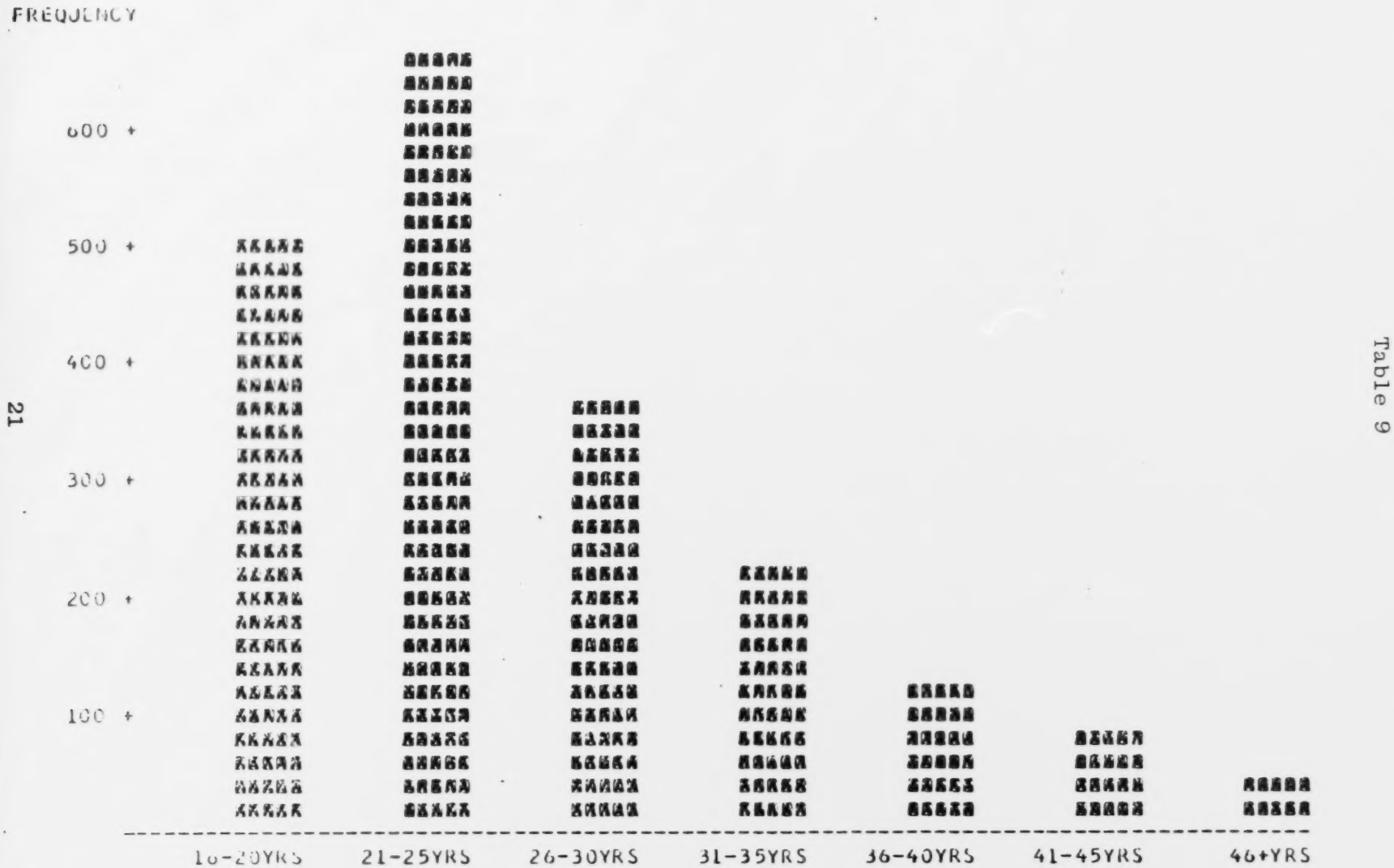


Table 9

STATISTICAL ANALYSIS SYSTEM

FREQUENCY BAR CHART

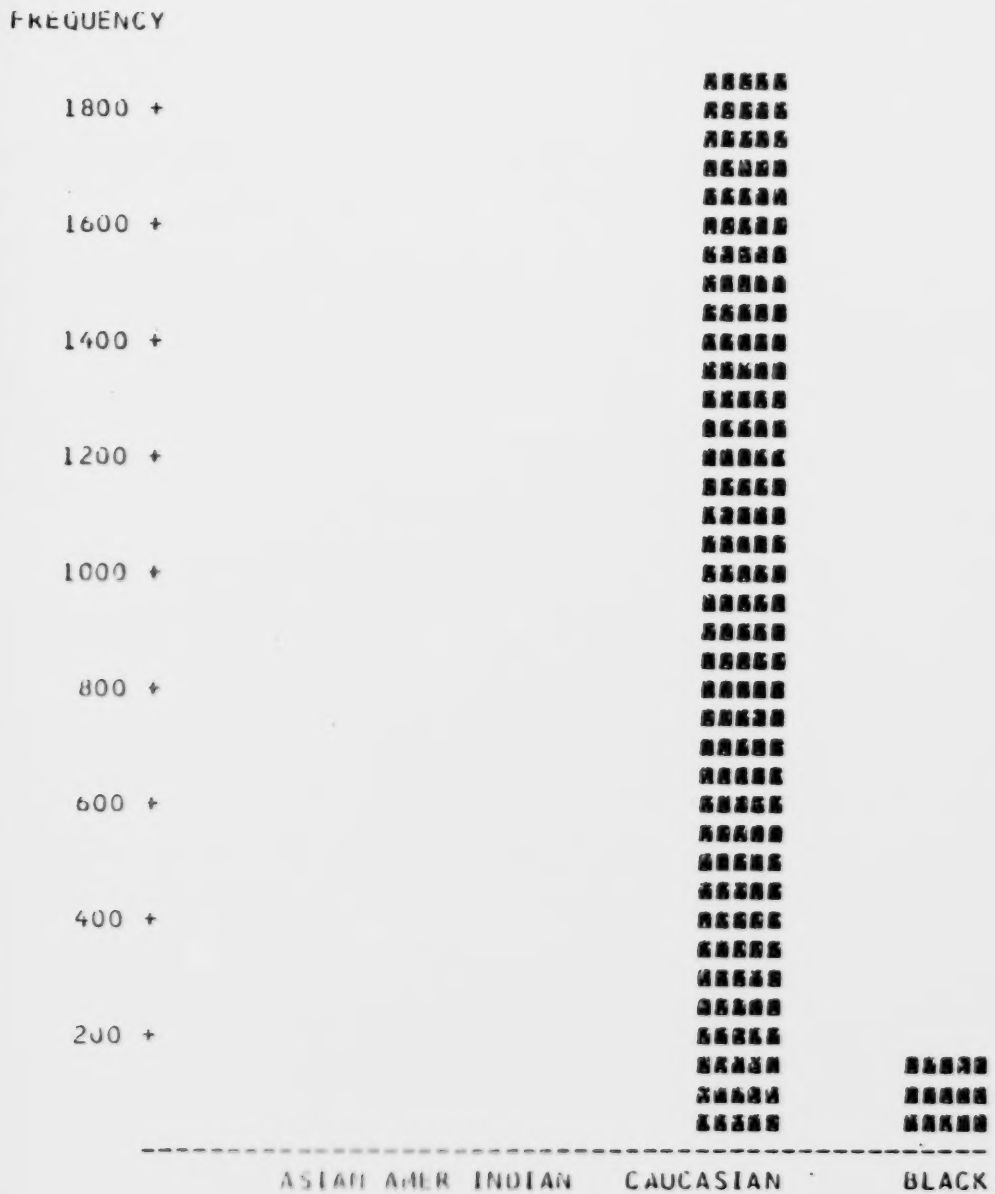


Table 10

STATISTICAL ANALYSIS SYSTEM

FREQUENCY BAR CHART

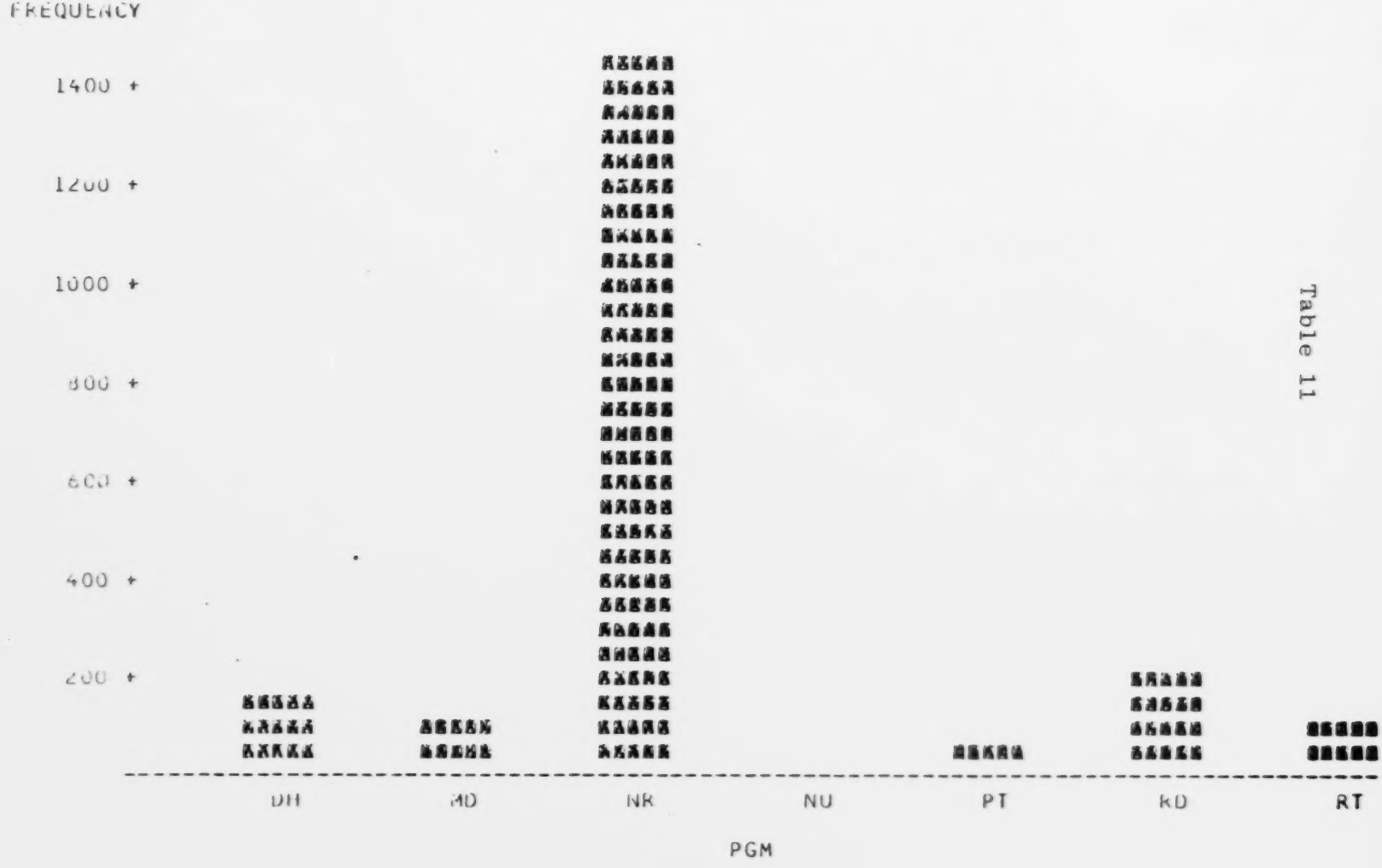


Table 11

It must be remembered that this data represents a sample of the health care programs in the state, but the data can in no way be considered a representative sample in the true statistical sense. Therefore, the reader should not attempt to make rigorous statistical generalizations about all allied health career programs based on this data. Nevertheless, the information is extremely useful in pointing out general trends and areas of interest for further research.

The total number of individual programs included in the study is 49. These 49 programs are drawn, as was indicated earlier, from 6 possible program areas. Again, those areas are: Associate Degree Nursing, Dental Hygiene, Physical Therapy, Radiology, Respiratory Therapy, and Medical Technology.

There is a considerable variance in frequency of programs included in the study, a reflection of the fact that some programs such as nursing are almost universally more popular than others. Table 1 (page 11) indicates the percent each program is of the total 49 programs.

Table 3 (page 13) indicates the average enrollment per program in 1982 and 1983. The figures are somewhat misleading. Since the standard deviations are large, we can assume a rather high variance from the figures when individual programs are considered. Table 2 (page 12) indicates the average drop out rate for all programs is 37 percent, a figure that is somewhat lower than the average drop out of all community college programs in the state. Table 3 (page 13) also indicates that a high percent of health program graduates pass the state board. This would seem to indicate in a general way that the health care

programs are doing a good job of preparing their graduates for what the state perceives to be professional competence. The other information on the program data profile has already been reported and does not need repeating.

The basic task of this project is to determine the relationship between measures of student success and various independent variables. As indicated earlier, those independent variables can include student personal characteristics, admissions test performance assessments, prior academic performance and prior academic work.

Age

The literature indicates that one important personal student characteristic related to student GPA performance is age. Basically the relationship is that the older the student, the more likely they will be to succeed in the program.

We do not have enough information to speculate on why that relationship exists. It has to do with increased maturity, better focused job goals, etc. In any case, the overall data analysis indicates that age and student GPA are positively correlated in our study.

Figure 2

Age and GPA

r = .24

N = 1606

Significant at less than .05 level

The individual program data is not as clear cut in relation

to age. Figure 3 presents the nursing sample profile. The average age of nursing students is the highest of all the samples. The correlation coefficient of .28 along with the probability level shows that age is significantly related to GPA performance. In other words, the older students do better than the younger students.

Figure 3

Nursing Program Profile Statistics

$\bar{x}$ = 28

r = .28

P = .0001

N = 1164

Only one other program shows a significant relationship between age and GPA success, the radiology program. Figure 4 indicates that radiology students do significantly better as they get older, this is true despite the fact that the average student is relatively young.

Figure 4

Radiology Program Profile Statistics

$\bar{n}$ = 19.5

r = .16

p = .02

N = 173

The other programs, dental hygiene, medical laboratory

technician, physical therapy and respiratory therapy all have data that indicates that no significant relationship exists between age and student GPA success.

Figure 5

Other Program Profiles

Dental Hygiene	Physical Therapy
$\bar{x}$ = age = 19	$\bar{x}$ = 19
r = .05	r = .27
p = .67	p = .07
n = 55	n = 41
Medical Laboratory Technology	**Respiratory Therapy**
$\bar{x}$ = 20	$\bar{x}$ = 19
r = .05	r = .04
p = .64	p = .69
n = 70	n = 86

Other student personal characteristics are less concrete, in fact, they were measured by subjective program director evaluations. These variables will be discussed later under the heading: Student Personal Characteristics.

Admissions Test Scores

One of the basic relationships this project is interested in exploring is that between admissions tests and student GPA performance. The following section discusses these relationships.

CGP

The allied health programs in North Carolina use a wide variety of tests to assess student preparation for entrance into their programs. However, the largest group of programs use the Comparative Guidance and Placement (CGP) series of tests.

Table 12 reports the series of correlations, probabilities, and number of observations associated with the CGP data.

Table 12

CGP/GPA Correlations/Probabilities/Observations

(Significant at .05)*

Title	Correlation	Probability	Number
*CGP Reading	.27	.0001	842
*CGP Sentences	.22	.0005	238
*CGP Math	.20	.0001	604
CGP Algebra	.13	.18	107
*CGP English	.28	.0001	511
*CGP Year Zero	.30	.0001	250
*CGP Letter Groups	.16	.02	205
*CGP Computation	.25	.0001	348
CGP Math and Reading	.00	.98	21
CGP Reading and Sentences	.15	.47	23

Generally speaking, the CGP series of tests seem to have strong predictive power in relation to GPA performance. The CGP Math and Reading and the CGP Reading and Sentences tests had observation counts too low to give reliable information, nevertheless, at this point, they are not significantly related to GPA performance. The CGP Algebra test is also not significantly related to GPA performance in our sample.

The other CGP tests are significantly correlated with GPA, although the degree of correlation varies. It is interesting to

note that most of the powerful predictors seem to share the dimensions of reading and English skills.

Table 13 contains information on the other tests used by programs. Note that the tests with a low number of observation (N less than 30) are not reliable indicators of the effectiveness of the test indicated so these test scores should be ignored. Included in that list are: Overall SAT, Cooperative Math, Cooperative English, DTLS English and DTLS Reading.

Note also that several admissions tests were not significantly related to GPA. Those tests were: SAT Math, SAT Verbal, ACT, Comparative Test of Basic Skills, SCAT Quantitative, SCAT Verbal, the Mountain Home Reading test and the Nelson Denny Total.

Table 13

Admissions Tests/Correlations/Probabilities/Observations
(Significant @ .05 Level)*

Title	Correlation	Probability	Number
SAT Math	.20	.12	57
SAT Verbal	.23	.08	59
*Prentice Hall English	.30	.0001	190
*PSB Occupations	.28	.01	81
Nelson Denny Total	.12	.06	223
*Nelson Denny Comprehension	.16	.003	318
*Nelson Denny Vocabulary	.12	.03	317
ACT Total	.01	.92	53
*Otis Lenon IQ	.17	.03	146
Comparative Test of Basic Skills	.23	.08	56
*Ward Speece Math	.55	.0001	60
SCAT Verbal	.12	.10	176
SCAT Quantitative	.04	.58	183
*Gates McGinty Reading	.36	.04	32
Mountain Home Reading	.01	.87	72
Local Math	.06	.23	379
Local English	.21	.02	114
Other Math	.12	.22	100
Overall SCAT	-.36	.33	9
Cooperative English	.17	.68	8
DTLS English	.79	.41	3
DTLS Reading	.90	.28	3

What is most interesting is the number of admissions tests that are significantly related to GPA.

Included in this group are the Prentice Hall English, the PSB Occupations, the Nelson Denny Comprehension, the Nelson Denny Vocabulary, the Otis Lennon IQ, the Ward Speece Math, the Gates McGinty Reading and several of the locally prepared math and English tests.

Of special interest are the Ward Speece Math with an r of .55 and the Gates McGinty Reading with an r of .36. Because of their use in specific programs, they will be discussed in more detail when the individual program data is evaluated.

Note also that tests which measure language skills seem to be consistently related to high GPA performance. For example, the Gates McGinty (r=.36), the Prentice Hall English (r=.30), the CGP Reading (r=.27) and the CGP English (r=.28) all measure some relationship between language and GPA performance.

Board Scores

A second dependent variable used as a measure of student success is state board scores. Although in some ways this is the most desirable measure of student success, it cannot be relied upon as the major variable of success because it is not as available a statistic as the student GPA.

Although the number of observations with board scores is much less, they do provide some additional information regarding student success. It is clear, for example in most cases, the admissions tests were more effective in predicting GPA than board scores.

Several exceptions are worth noting. Table 14 reports

admissions tests that seem to have a stronger relation to board scores than they do to GPA.

Table 14

High Board/Admission Test Correlations

Test	Board r	GPA (r)	Board p	GPA (p)	Board n	GPA (n)
CGP Sentences	.30	(.22)	.05	(.005)	39	(238)
CGP Computation	.40	(.25)	.00	(.00)	64	(348)
Nelson Denny Total	.41	(.09)	.00	(.18)	40	(195)
Nelson Denny Comprehension	.32	(.25)	.00	(.00)	78	(296)
Nelson Denny Vocabulary	.23	(.12)	.03	(.03)	78	(284)

Student Personal Characteristics

Each program director or faculty person was asked to rate each student in relation to 11 student variables. The student variables represented a summarized list of important positive characteristics that the program director indicated were associated with student success.

Table 15 reflects the results of those evaluations. Each row represents a student characteristic, the coefficient of correlation between it and GPA, the probability level, and the number of responses.

This table is really a profile of the successful allied health student. It indicates the broad characteristic profile needed to be effective.

Table 15

Student Personal Characteristics/GPA
Pearson Correlation Coefficients/Probabilities/Observations

Student Characteristic	r	Probability	Number
Motivation	.45	.0001	1237
Maturity	.40	.0001	1231
Past Academic Success	.53	.0001	1184
Reading Ability	.46	.0001	1183
Adequate Finances	.29	.0001	1197
Realistic Expectations	.41	.0001	1208
Attitude	.31	.0001	1226
Study Skills	.56	.0001	1203
Science Background	.48	.0001	1169
Math Background	.47	.0001	1169
People Skills	.28	.0001	1222

You will recall that the student success variables were divided into four categories. Prior academic qualifications, prior academic performance, admissions test data, and personal characteristics data. That structure overlaps the eleven variables listed as student characteristics.

Prior Academic Qualifications

Science background (r = .48) and math background (r = .47) represent indicators of potential student success based on previous academic work. The prior academic work dimension of student success refers to the kind of course work taken by the student prior to entrance in an allied health program. These high r values indicate that program directors see a strong relationship between math/science and success.

Past Academic Performance

Past academic success (r = .53), reading ability (r = .46), and study skills (r = .56) are all indicators from past

performance as to how well the student performs in an academic setting. For program directors, past performance is a strong indicator of future success.

Admissions Test Data/Student Characteristics

The admissions test data has already been discussed in an earlier section. Therefore, the only remaining dimension to be evaluated is student characteristics.

Student Characteristics

Student characteristics can be somewhat arbitrarily divided into two subgroups: observable characteristics and perceived characteristics. Observable characteristics are those indicators that can be observed in some reasonable, concrete manner. Age, adequate finances, and health are some examples of observable characteristics.

Perceived student characteristics are much more difficult to observe and record. They require a trained, unbiased observer with enough time to interview and determine student levels. They are particularly difficult to observe prior to admission because program personnel do not normally have much contact with potential students prior to classroom work.

Nevertheless, these characteristics are important indicators of student success and should be considered in any predictor model. Perceived student characteristics and their correlation with GPA are as follows: motivation (r = .45), maturity (r = .40), realistic expectations (r = .41), attitude (r = .31), and people skills (r= .23).

It is clear that these variables provide important information concerning student success, it is not clear that the

information they provide can be utilized "as is" in a student admissions model. Several additional questions need to be answered.

First of all, the question of applicability of the data to specific allied health programs is important. More information needs to be developed concerning how these specific variables are related to specific programs. That analysis occurs in the next section. Secondly, it is probable that some of the variables may be highly intercorrelated. Highly intercorrelated variables are somewhat limited in their usefulness in a multivariate model. This problem will be discussed later.

Program Differences

As was indicated earlier, the allied health professions are not monolithic in terms of their admissions requirements. Different programs have different requirements, consequently, their admissions criteria may vary.

For example, nursing programs with a heavy requirement in basic science knowledge may vary in admissions requirements from another allied health program which emphasizes psychomotor skills.

Therefore, the general conclusions which result from looking at aggregate allied health program data, may be subject to modification when the data is analyzed by program.

Program Admissions Tests

This section discusses significant differences between the aggregate data and program data in relation to admissions tests. The next section will look at the same relationships in regard to

the student characteristics data.

Table 16 lists the admissions tests correlations by program. The list is shorter than the general admission test listing because many programs only use a few types of tests. Table 16 indicates the program, the number of students in that program taking a specific test, the correlation coefficient, and the significance probability. Those tests with a * beside them are significantly correlated with GPA at the .05 level, the others are not significant.

Table 16

Dental Hygiene			
Admissions Test	N	r	p
CGP Math and Reading	21	.005	.98
Overall SAT	3	.165	.89
*P-H English	71	.24	.04
PSB Health	68	.06	.60
N-D Comprehension	40	-.19	.22
N-D Vocabulary	39	.14	.37
Mountain Home Reading	34	-.14	.40
Local Math	105	.02	-.22
Local English	34	.17	.32

Medical Lab Technology			
Admissions Test	N	r	p
CGP Reading/Sentences	23	.16	.47
CGP Math	23	.35	.09
SAT Math	3	-.93	.23
SAT Verbal	4	-.09	.91
Cooperative Math	7	.24	.60
Cooperative English	8	.17	.68
*Comparative Test Basic Skills	27	.44	.01
*Ward Speece Math	27	.61	.00

Nursing

Admissions Test	N	r	p
CGP Reading	700	.32	.00
CGP Sentences	215	.22	.00
CGP Math	488	.20	.00
CGP Algebra	42	.25	.10
*CGP English	422	.27	.00
CGP Letter Group	205	.16	.01
CGP Computation	254	.15	.01
SAT Math	19	.43	.06
SAT Verbal	19	.49	.03
P-H English	80	.30	.00
N-D Total	221	.09	.16
N-D Comprehensive	233	.22	.00
N-D Vocabulary	233	.13	.05
ACT Total	52	.00	.97
Otis Lenon IQ	101	.00	.98
SCAT Verbal	141	.14	.09
SCAT Quantitative	148	.05	.58
Gates McGinty Reading	32	.36	.04
Mountain Home Reading	38	.13	.42
Local Math	267	.22	.00
Local English	80	.17	.12
DTLS English	3	.79	.41
DTLS Reading	3	.90	.28

Physical Therapy

Admissions Test	N	r	p
*P-H English	31	.37	.03
PSB	5	.59	.29
N-D Comprehension	17	.03	.88
N-D Vocabulary	17	.01	.96
*SCAT Verbal	35	.46	.00
*SCAT Quantitative	35	.36	.03

Radiology

Admissions Test	N	r	p
CGP Reading	98	.24	.01
CGP Sentences	23	.43	.03
CGP Math	67	.05	.64
CGP Algebra	45	.50	.00
CGP English	46	.06	.69
CGP Computation	48	.27	.06
Overall SAT	3	-.87	.31
SAT Math	22	.28	.20
SAT Verbal	23	.23	.27

N-D Comprehension	6	.20	.69
N-D Vocabulary	6	.30	.55
Otis Lenon IQ	22	-.03	.87
Comparative Test Basic Skills	29	.24	.19
*Ward Speece Math	33	.65	.00

Respiratory Therapy

Admissions Test	N	r	p
CGP Reading	34	.17	.34
CGP Math	26	.50	.00
CGP Algebra	11	.45	.16
CGP English	34	.47	.00
CGP Computation	37	.53	.00
SAT Math	9	.21	.58
SAT Verbal	9	-.53	.13
P-H English	8	.48	.22
PSB	8	.67	.06
N-D Comparative	22	.04	.85
N-D Vocabulary	22	.29	.18
Otis Lenon IQ	23	.45	.03
Local Math	7	.73	.05

Tests which were found to be more effective with individual programs than with all allied health programs are listed in Table 17.

Table 17

Program Effective Admissions Tests

Test	Program	r	Correlation Increase Change
Comparative Test Basic Skills	Medical	.44	+.20
Ward Speece Math	Medical	.61	+.06
N-D Comprehensive	Nursing	.22	+.06
P-H English	Physical Therapy	.37	+.07
SCAT Verbal	Physical Therapy	.46	+.34
SCAT Quantitative	Physical Therapy	.36	+.32
CGP Sentences	Radiology	.43	+.21
CGP Algebra	Radiology	.50	+.37
Ward Speece Math	Radiology	.65	+.10
CGP English	Respiratory Therapy	.47	+.19
CGP Computation	Respiratory Therapy	.53	+.28

This table provides important information because it indicates that certain programs are much more highly correlated with certain admissions tests than those tests are with the general allied health sample. In certain cases, the r gain achieved by applying only the test to specific programs is significantly higher. For example, the CGP Algebra test has an r of .50 when correlated with radiology students GPA as compared to an r of .13 with the general sample.

Perceived Data

Table 18 presents the correlation of GPA With each perceived characteristic; first in terms of all the data and then by program.

The dental hygiene values are shown without comment because the number of observations is too low for a stable evaluation. The other programs reveal some significant differences in value correlations with student GPA.

Note first of all that with a few exceptions (indicated with a slash), all of the programs have high correlations between specific perceived characteristics and GPA. In other words, these variables represent important potential predictors of student success.

Study skills appears to be the most consistent, highly ranked variable by all the programs with a r range of .51 to .65. A second consistent variable is past academic success; the r range is from .51 to .65. Other important variables that have fairly high correlations across all programs include motivation (r range from .39 to .79); reading ability

(r range from .35 to .65); science background (r range from .43 to .66). In other words, program directors from all the allied health programs (excluding dental hygiene because of its low N) have rated students in their programs and consistently ranked a similar group of variables as important. Again, they are motivation, past academic success, reading ability, realistic expectations, study skills, science background and math background.

Table 18

Correlation of GPA/Perceived Characteristics
by Program
(Correlation Coefficients/Prob.R/Observations)*

	Overall	DH	Nur	Med	RT	Rad	PT	Range
Val 1	0.45432*	.23	.40	.79	.55	.39	.50	.39
Motivation	0.0001	.29	.00	.00	.00	.00	.00	.79
	1237	22	903	70	65	136	41	
Val 2	0.40076	.29	.45	.40	.37	.28	.52	.28
Maturity	0.0001	.17	.00	.00	.00	.00	.00	.52
	1231	22	905	60	65	138	41	
Val 3	0.52808	.37	.51	.62	.66	.52	.65	.51
Past Aca Suc	0.0001	.08	.00	.00	.00	.00	.00	.65
	1184	22	876	43	65	137	41	
Val 4	0.45929	.58	.42	.49	.66	.51	.64	.42
Reading Ability	0.0001	.00	.00	.00	.00	.00	.00	.66
	1183	22	886	43	65	126	41	
Val 5	0.28532	-.11	.25	.67	.47	.24	-.01	-.01
Adeq Finances	0.0001	.61	.00	.00	.00	.00	.94	.67
	1197	22	892	53	65	124	44	
Val 6	0.40527	.06	.37	.65	.50	.36	.47	.36
Realis Expec	0.0001	.78	.00	.00	.00	.00	.00	.65
	1208	22	875	70	65	136	40	

Val 7	0.30912	.22	.32	.66	.13	.20	.44	.13
Attitude	0.0001	.32	.00	.00	.27	.01	.00	.66
	1226	22	900	60	65	138	41	.66
Val 8	0.55662	.33	.54	.60	.73	.56	.66	.54
Study Skills	0.0001	.13	.00	.00	.00	.00	.00	.73
	1203	21	889	60	65	127	41	
Val 9	0.47864	.59	.43	.66	.58	.51	.55	.43
Science Bkgrnd	0.0001	.00	.00	.00	.00	.00	.00	.66
	1169	22	853	53	64	136	41	
Val 10	0.47237	.59	.43	.66	.54	.48	.55	.43
Math Bkgrnd	0.0001	.00	.00	.00	.00	.00	.00	
	1162	21	848	53	63	136	41	.66
Val 11	0.27988	.17	.30	.34	.05	.25	.43	.05
People Skills	0.0001	.42	.00	.00	.68	.00	.00	.43
	1222	22	901	60	65	138	36	

*The attitude variable is not as important as far as radiology programs are concerned, but the other programs find it important.

The other variables in the eleven characteristic profile are not as consistently rated high by program directors. Maturity is generally considered important (r = .28 to .52), although the radiology program tends to view maturity as less important. The adequate finances variable also is somewhat inconsistent. Physical therapist programs do not find it a significant factor in student success. Medical technology programs find it to be highly important, while nursing, respiratory therapy and radiology programs consider it to be relatively important.

The people skills variable ranges from a low of .05 and not significant in respiratory therapy to .43 and significant with physical therapy, perhaps a reflection of the amount of interpersonal relations that occurs in these two extremes.

Summary of Data Analysis

It is clear from the sample data drawn from allied health programs that there is available certain information which can be

useful in predicting student success.

For example, the study indicates that certain admissions tests have fairly high correlation coefficients when related to student GPA. Further analysis reveals that specific admissions tests are even more effective when coupled with specific programs rather than all allied health areas.

Also, the study indicates that a group of eleven characteristics--previously determined to be relevant by program directors--are generally highly correlated with student success. Again, that conclusion is somewhat modified by the fact that several variables are not significantly related to student success in several specific programs.

In essence, the study indicates that it is potentially possible to build a predictor model of student success based on a combination of carefully selected variables. Further, it is clear that such a model should be program specific, in other words, each program model should be based on its own combination of variables.

Model Building

The health career success model that can be constructed from the sample data uses three variable groups: age, admissions tests, and personal characteristics. A multivariate model, therefore, would be in the general form:

$$GPA = a + B\,x + B\,y + b\,z$$

where:

x = age
y = admissions tests
z = perceived characteristics
a = intercept

Based on the available data, a model can be constructed that represents the "best fit" for each program. Construction of the actual models was done in the following manner.

Variables for each program are separated into the major groups mentioned above. Further, each of the major variables is subdivided by program area. For example, the major characteristic age is subdivided into Age/GPA correlations by program area.

Those program specific variables with high correlation coefficients are selected to be part of each program specific model. The selected variables are entered into a stepwise, multiregression procedure which is designed to build a "best fit" multivariate model. Each of the program models built in such a fashion is discussed below.

Nursing Model

Those variables from the three major categories that have high sample correlations with student grades are entered into a stepwise multiple regression program. Variables entered include: study skills, maturity, science background, Gates McGinty Reading, CGP Reading (a separate run from Gates McGinty) and age. In other words, the two program specific models that are run, in general form are:

1. GPA = CGP Reading + Study Skills + Maturity + Science + Age
2. GPA = Gates McGinty + Study Skills + Maturity + Science + Age

The order of entrance of the data into the model is based on Maximum R-Square Improvement of the Dependent Variable. The first procedure resulted in the following model:

$$GPA = 1.08\,a + .008\,y + .122\,z_1 + .223\,z_2$$

where: y = CGP Reading Scores

z_1 = Maturity

z_2 = Study Skills

and: R^2 = .41 Significant at .001 level

DF = 489

F = 114.34

Notice that the $\underline{R}^2$ measure is used rather than the $\underline{R}$ measure. The interpretation of this statistic is as follows. It represents the variance of the dependent variable (GPA) associated with the joint variance of the independent variables. In other words, 41 percent of the variance in student GPA can be predicted by knowing values for (1) the level of CGP Reading Score, (2) maturity level and (3) level of study skills.

Use of the Gates McGinty scores leads to a somewhat less effective predictor model in overall terms. The second model is:

GPA = .039a + .171 x + .018 y

where: x = age

y = Gates McGinty Reading

and: $\underline{R}^2$ = .30 Significant at the .004 level

DF = 31

F = 7.47

Radiologic Model

Use of the Ward Speece Math test along with several other perceived variables leads to a strong predictor model for the radiology program. Part of the reason for this strength may lie in the homogenity of the program data as compared to the much larger nursing sample.

The best model is as follows:

$$*GPA = -.906\,a + .052\,y + .28z_1 - .388z_2 + .379z_3$$

where: y = Ward Speece Math Test

z_1 = Past Academic Success

z_2 = Reading Ability

z_3 = Study Skills

and: $R^2 = .65$ Significant at the .001 level

DF = 32

F = 12.96

This indicates that 65 percent of the variance in student grades can be predicted in this sample from knowledge of these variables. A good model.

Respiratory Therapy

The respiratory therapy data is also small and more homogeneous. However, in this case, the smallness creates a problem of acceptance. The small sample size indicates that any conclusions are not as acceptable as those with larger samples.

$$GPA = .532\,a + .015\,y = .033\,z_1 + .46\,z_2$$

where: y = CGP Computation

z_1 = Reading Ability

z_2 = Study Skills

and: $R^2 = .67$ Significant at .0008 level

DF = .23

F = 13.75

Again, 67 percent of the variance in the dependent variable GPA is predicted by the variance of the independent variables of study skills, CGP computation, and reading ability.

Physical Therapy

The best physical therapy model consists of three variables:

$$GPA = .193\,a + .005\,y + .132\,z_1 + .100\,z_2 + .091\,z_3$$

where: y = SCAT Verbal

z_1 = Past Academic Success

z_2 = Reading Ability

z_3 = Study Skills

and: $R^2 = .62$ Significant at .001 level

DF = 34

F = 12.20

The other programs did not contain enough data to develop a model.

These models represent a first attempt to develop program specific models useful to admissions people in determining those students with the highest probability of entrance. They would be used in the following manner in a real admissions situation.

Suppose the respiratory therapy program at XYZ college had developed an admissions model for their program utilizing the model previously mentioned. That is: GPA = CGP Computation + Reading Ability + Study Skills. The program director (or admissions counselor) would gather data from student applications regarding their CGP Computation score and an assessment of their reading ability and study skills on a scale of 1 to 5, with 5 being tops. This data would be plugged into the model:

GPA = .532 (intercept) +.015 (CGP score) - .093 (reading assessment) + .46 (study skills assessment)

Each student would then receive a score indicating

how well they might do in the future in regard to GPA.

The data would become part of their overall admissions evaluation and would enable the admission's person to make a fairer evaluation of each student's qualifications.

Conclusions

The purpose of this research was to (1) identify admission variables that are associated with student success in various allied health programs in North Caorlina, (2) develop admissions models that would enable program directors to make more effective assessments of the probability of success of entering students.

Forty-nine allied health programs across the state participated in the project. Data was gathered from the 1982 and 1983 classes on admissions tests, GPA averages, and subjective evaluations. The data was analyzed first by simple correlation analysis which measures the degree of relationship between two variables. Promising variables were entered into a multivariate statistics procedure which builds a "best fit" model showing the relationship between the dependent variable GPA and various independent or predictive variables.

Preliminary models were developed for three of the programs. These preliminary models represent a "first pass" attempt to develop reliable admissions models.

For a number of reasons, the models developed in the research are not effective enough to be used in their present form. Therefore, this section discusses what could be done in future work to make these models useful in specific programs.

First of all, there is some difficulty in using the

perceived student characteristics variables in the multivariate model. It is highly likely that many of the perceived variables are intercorrelated with each other and therefore not as useful as independent predictors.

This paper will not discuss the complex problems involved in dealing with the interdependent data because time constraints on this research preclude their use.

Suffice it to say that any extension of research on this data should include a factor analysis of the dimensionality of the perceived variables in order to reduce them to more useful forms.

A second problem with this research has been its timeframe. Originally, the project was to be a longitudinal project over a three-year period. Such a time span would have given the researchers time to set up a series of experimental strategies designed to compare admissions tests and preadmissions assessments of students across school and program. Because of the limited time of the project, this carefully planned experimental design framework had to be set aside for a field study--useful--but not as powerful in terms of generalizations.

Thirdly, and more positively, the broad consensus of program directors concerning the eleven perceived variables should certainly point future research in the direction of assessing some of these characteristics prior to admissions. Certainly such data will improve admissions selections.

Fourthly, models for several programs could not be developed because the total number of observations were too low. Future research needs to work to gain the cooperation of all programs

in the state serving a particular allied health technology, in order to gain a large enough number for significant statistical work.

Specific Recommendations for Future Research

1. Present data be further analyzed using factor analysis to determine the dimensionality of the eleven perceived factors.
2. Future research use the information on admissions tests to set up experimental comparisons between tests within specific program areas.
3. Allied health programs across the state be encouraged to participate in future research by carefully gathering required data.
4. Specific admissions models be developed for specific allied health programs based on the overall conclusions of this research.

References

1. Astin, A. W. Predicting Academic Performance in College. New York, the Free Press, 1971.

2. Schwirian, Patricia M. Predictions of Successful Nursing Performance, Part I and II. Bethesda, MD: Health Resources Administration, 1976.

3. Bellow, Ann. Factors Which Predict Success or Failure in an Associate Degree Nursing Program. Hartford, CT: Connecticut Vocational Educational Research and Planning Unit, June, 1977, 159 pgs.

4. Larkin, Paul G. Admissions Test Results as Criteria for Entrance into the Nursing Program and Regression Analysis of Entrance Tests and Predictors of Success in Nursing State Board Exams. Larzo, MD: Prince George's Community College, Office of Institutional Research, 1977.

5. Bistereich, Alan M. Predicting Grade Point Average, Withdrawal and Graduation from Four Allied Health Programs at Miami-Dade Community College Medical Center Campus. Miami, Miami-Dade Community College, 1977, 103 pgs.

6. Tatham, Elaine, Nursing and Dental Hygiene Selection Procedures, Part 2: An Examination of Academic Variables as Predictors of Success. Overland Park, Kansas: Johnson County Community College, 1975, 82 pgs.

7. Persisters and Withdrawals: An Analysis of the Difference. Kansas City, MO: Research Medical Center, 1975, 20 pgs.

8. Meier, Robert, Miller, Carol and Wilk, Scott. Variables Related to Academic Success for Associate Degree Nursing Students. Washington, DC: National Council of Measurement in Education Meeting, March 31 - April 2, 1975.

9. Keene, James W. A Follow Up Study of the Registered Nursing Program. Cupertino, CA: Foothills Junior College District, May, 1968, 24 pgs.

10. Rogers, Raymond. A Multiple Regression Analysis of the Variables from the CGP Test Upon GPA. Unpublished Graduate Seminar Paper, Northwestern University, June, 1979.

APPENDICES

Appendix 1

Health Careers Success Project
Program Questionnaire

Name of School _____ Phone

Name of Program _____

Program Director _____ _____

Counselor _____ _____

No. of students entering class of 1982 _____ (Fall)

No. of students entering class of 1983 _____ (Fall)

Average dropout rate for program _____

Percentage pass on State Board Exam _____

Indicate the names of entrance tests you use to qualify entering students in your program. Also, indicate cut off scores, if that information is available.

Test Name	Cut off score for regular admission	Cut off score for admission w/remediation	Cut off score for non admission

Indicate the major criteria used by your program to determine student entrance.

	Yes	No
1. H. S. diploma or equivalent	___	___
2. Minimum standards on placement test	___	___
3. H. S. grade point average above minimum	___	___
4. H. S. rank	___	___
5. Successful interview	___	___
6. Algebra (passed)	___	___
7. Chemistry (passed)	___	___
8. Biology (passed)	___	___

Other criteria used:

_____

_____

_____

Please choose the word that most nearly describes the entrance requirements of your program.

Highly Selective	Selective	Average	Partially Open Door	Completely Open Door

In your own words, briefly indicate what your believe to be the most important determinants of success in your program.

_____

_____

_____

_____

_____

Check yes if you wish to receive a summary of the data collected.

_____yes no_____

Thank you very much for filling out this questionnaire. Please return to:

Norman Petty, Director
Health Careers Success Project
c/o Central Piedmont Community College
P. O. Box 35009
Charlotte, NC 28235

State Courier #518

Appendix 2

Student Data Profile
(Fill out one for each student)

1. College Code ☐☐ 2. Program Code ☐☐

3. Student Number ☐☐☐

4. Student Age Grouping

- [1] 16-20
- [2] 21-25
- [3] 26-30
- [4] 31-35
- [5] 36-40
- [6] 41-45
- [7] 46-over

5. Race

- [1] Asian
- [2] American Indian
- [3] Caucasian
- [4] Black

6. Entering Class of
- ☐ Fall, 1982
- ☐ Fall, 1983

7. Student Status

- [1] In School
- [2] Graduated
- [3] No Longer in School
- [4] Status Unknown

8. Cumulative Grade Point Average ☐☐☐

9. Entrance Tests Taken

Student Score

10.	State Board Status	[1]	Not Taken
		[2]	Taken, Passed
		[3]	Taken, Failed
		[4]	Retake

11.	State Board Score (if applicable)	

Indicate Known Characteristics of This Student*

	Characteristic	Excellent	Good	Average	Fair	Poor
12.	Student Motivation					
13.	Student Maturity					
14.	Past Academic Success					
15.	Reading Ability					
16.	Adequate Finances					
17.	Realistic Expectations of Profession					
18.	Good Attitude					
19.	Study Skills					
20.	Good Science Background					
21.	Good Math Background					
22.	People Skills					

*Please see note on enclosed letter regarding this question.

Appendix 3

cpcc
CENTRAL PIEDMONT
COMMUNITY COLLEGE

POST OFFICE BOX 35009
CHARLOTTE, NORTH CAROLINA 28235
TELEPHONE 704 373-0633

January 12, 1984

The following letter was sent and positive response(s) received from:

Dear

The North Carolina Department of Community Colleges recently funded a project which may be of interest to you. The project is called "A Model to Improve the Success Rate of Students in Selected Health Career Programs in the North Carolina Community College System." The particular programs selected for study are Associate Degree Nursing, Medical Laboratory Technology, Physical Therapist Assistant, Radiologic Technology, Respiratory Therapy, and Dental Hygiene.

The project is centered around four goals. The first goal is to collect data relevant to student success or failure in the targeted health career programs. Data will include specific student profiles, past entrance exams, and student grades. Additional data will be obtained by administering pre-selected qualifying exams to targeted students. This data will be used to compare the relative merits of presently used exams.

The second goal is to statistically analyze all data in order to seek out valid relationships between available entrance information and potential student performance. The third goal is to utilize the results of the statistical analysis to develop a model that will help advisors choose students with a reasonable chance for success in particular health programs. The fourth goal is to disseminate findings as widely as possible within the community college system.

It is obvious that a project of this magnitude requires a great deal of cooperation from individual health career program directors and department heads if it is to be successful. That is, of course, the reason I am writing this letter to you.

Simply stated, I am asking you to help with the project in two ways: (1) by gathering data about your students in your

Equal Opportunity Affirmative Action Employer

programs and (2) by administering a qualifying exam provided by the project at the beginning of the Fall, 1984 school year. In doing so, you would be designated a Project Resource Person, Health Careers Success Project.

Like most people, you may be a little reluctant to agree to an open-ended commitment without more information. Therefore, let me share some additional details of the project with you.

1. The project is funded through the North Carolina Department of Community Colleges.

2. Dr. Vercie Hardee, Program Coordinator for Health Career Programs, is a member of the Advisory Board of the project and is in agreement with its objectives.

3. Data collection for each school will be of a limited amount and should not be burdensome to anyone.

4. Data collection will be designed so that individual names are not known, thus maintaining student confidentiality.

5. Data reporting will be in total without any identification of individual schools.

6. Direct costs will be borne by the project.

7. Presidents of the institutions will be contacted for final approval of participation.

I hope that you will be able to help us out in this project. Would you take time to fill out the enclosed information sheet and return to me. And, if you have questions, please indicate your phone number and I'll be glad to contact you.

Thank you.

Sincerely,

Norman Petty
Director
Health Careers Success Project

Enclosure

HEALTH CAREERS SUCCESS PROJECT

_____ Yes, my institution will be able to participate in the project.

_____ Maybe. Please contact me so that I can get more information.

President's Name: _____

Institution: _____

Address: _____

_____

State Courier #: _____

Phone: _____

Please return form to:

Norman Petty, Director
Health Careers Success Project
c/o Central Piedmont Community College
P. O. Box 35009
Charlotte, NC 28235

POST OFFICE BOX 35009
CHARLOTTE NORTH CAROLINA 28235
TELEPHONE 704 373-6633

cpcc
CENTRAL PIEDMONT
COMMUNITY COLLEGE

May 30, 1984

TO: Participants, Health Careers Success Project

FROM: Norman Petty

Thank you so much for sending in the first data profile on your program. I am using your information along with that from the other programs to build a data file. As soon as the file is complete, I will run some generalized descriptive procedures and send you the first of several reports I intend to develop.

Enclosed you will find a number of copies of the second main data sheet, the student profile. I have tried to include enough for every student in the Fall classes of 1982 and 1983. If there is not enough, I would appreciate it if you would make enough additional copies to complete the group.

I don't believe you will find any great difficulty in figuring out how to respond to most of the questions. I have included some comments below to cover any questions that might arise.

1. Please note that I have already assigned a college and program code to your specific program (1 and 2).

2. I have no interest in knowing the individual names of students so I would appreciate it if you would assign a student number to your students. My only request is that you keep up with the student name and student number so that when and if I need additional information (i.e. their end of Fall Quarter, 1984 GPA) it will be easy to match student and code.

3. In #9, I have written in the tests that you indicated the students took as part of their entrance process. This is one of the most important data items on the whole instrument and I would appreciate it if you could answer this one even if you leave off some of the others.

4. The questions 12-22 are the most difficult to answer because they require individual assessments of students, something that is difficult to do in the larger programs. If this

BEST COPY AVAILABLE

BEST COPY AVAILABLE

series of questions is too much of a burden because of the large number of students, leave it off.

I forgot to ask one question on the last instrument so I would appreciate it if you could include the information when you send this data back.

Please give me the numerical equivalents of your grading system so that I can convert your student grade point averages to standard scores. In other words, please tell me your letter grade system and their numerical equivalents. Example: A, B, C, IM. A = 90-100, B = 80-89, C = 70-79, IM is below 70.

Thank you in advance for filling out these profiles on your classes of 1982 and 83 students. When these profiles are returned, I will have most of the information I need to complete this study. In fact, I will only need the end of quarter GPA's (Fall, 1984) to be finished.

If you have any questions, please call me at (704) 373-6424.

Appendix 5

POST OFFICE BOX 35009
CHARLOTTE, NORTH CAROLINA 28235
TELEPHONE 704.373-6633

CENTRAL PIEDMONT
COMMUNITY COLLEGE

July 23, 1984

TO: Health Careers Success Project Participants

FROM: Norman Petty

Thanks for returning the School Data Profiles on your health program.

Just a reminder that I also need the individual Student Profiles to complete the project. If you did not receive copies of the student profile or if you need more, just drop me a note or call (704) 373-6424 and I will send them to you.

My address is: Norman Petty, Health Careers Success Project, c/o Central Piedmont Community College, P. O. Box 35009, Charlotte, NC 28235.

Thanks again for your help.

Enclosures

POST OFFICE BOX 35009
CHARLOTTE NORTH CAROLINA 28235
TELEPHONE 704/373-6633

Appendix 6

CENTRAL PIEDMONT
COMMUNITY COLLEGE

March 26, 1985

TO: Participants, Health Careers Success Project

FROM: Norman Petty
Courier #518

Thank you so much for your continuing support of our Health Careers Success project. We have received data sheets for over 1,800 students and we are currently developing analysis and evaluation procedures.

We need some more information from you to refine our figures. Would you please complete the chart below and return to me.

We appreciate your taking time to assist us in our study.

Grade	GPA Equivalent (i.e., 4.00, 3.00, etc.)
A	_____
B	_____
C	_____
D	_____
F	_____
I	_____

Data supplied by: _____
(name)

For: _____
(college)

Appendix 7

~~Health~~ Careers Success Project
Program Questionnaire

SAMPLE

Name of School Eastern Carolina Technical Institute Phone 919-3456789

Name of Program Associate Degree Nursing

Program Director Mrs. Adele Smith Ext 6743

Counselor Ms. Mary Brown Ext 6735

No. of students entering class of 1982 60

No. of students entering class of 1983 54

Average dropout rate for program 65%

Percentage pass on State Board Exam 73%

Indicate the names of entrance tests you use to qualify entering students in your program. Also, indicate cut off scores, if that information is available.

Test Name	Cut off score for regular admission	Cut off score for admission w/remediation	Cut off score for non admission
PSB - Academic Aptitude	25%+	Less than 25%	N/A
" Spelling	"	"	"
" Reading Comprehension	40%+	Less than 40%	"
" Natural Science	25%+	Less than 25%	"
Prentice-Hall	25%+	" "	"

Indicate the major criteria used by your program to determine student entrance.

	Yes	No
1. H. S. diploma or equivalent	✓	
2. Minimum standards on placement test	✓	
3. H. S. grade point average above minimum	✓	
4. H. S. rank		✓
5. Successful interview	✓	
6. Algebra (passed)		✓
7. Chemistry (passed)	✓	
8. Biology (passed)	✓	

Other criteria used:

we look at their high school English grades very closely

Please choose the word that most nearly describes the entrance requirements of your program.

Highly Selective | (Selective) | Average | Partially Open Door | Completely Open Door

In your own words, briefly indicate what your believe to be the most important determinants of success in your program.

I believe the student's past school record, family background and level of maturity are the most important determinants of success.

Check yes if you wish to receive a summary of the data collected.

✓ yes no____

Thank you very much for filling out this questionnaire. Please return to:

Norman Petty, Director
Health Careers Success Project
c/o Central Piedmont Community College
P. O. Box 35009
Charlotte, NC 28235

State Courier #518